

CLAIMS

1. A method of determining impulse responses of a medium (2) in relation to the transmission of waves between different points (T1-TN), method comprising:
 - 5 (a) at least one step of emission in the course of which waves are emitted into the medium (2) by generating signals $e_i(t)$ on the basis of a number N of emission points (T1-TN) belonging to the medium, where
 - 10 N is an integer at least equal to 2 and i is an index lying between 1 and N which designates one of said N emission points,
 - (b) at least one step of reception in the course of which signals $r_j(t)$ are picked up from said waves after
 - 15 transmission in said medium, at a number M of reception points (T1-TN) belonging to the medium, where M is a non-zero natural integer and j is an index lying between 1 and M which designates one of said M reception points,
 - 20 (c) and at least one step of determination of said impulse responses $h_{ij}(t)$ between each emission point i and each reception point j on the basis of the signals emitted $e_i(t)$ and picked up $r_j(t)$,
- characterized in that in the course of step (a), said N
- 25 emission points (T1-TN) are made to simultaneously emit the signals $e_i(t)$, these signals $e_i(t)$ having a duration T and each being a sum of n substantially monochromatic elementary signals, of like amplitude and of respective frequencies $f_{0,i+k}\cdot\delta f$, where $f_{0,i}$ is a
- 30 predetermined eigenfrequency at the point i, k is an integer lying between 0 and n, n is an integer at least equal to 2 and δf is a predetermined frequency interval, the respective eigenfrequencies $f_{0,i}$ at the various points i being distinct and lying in a
- 35 frequency band of width δf ,
- and in that in the course of step (c), each impulse response $h_{ij}(t)$ is calculated on the basis of a signal

of correlation between the signal $e_i(t)$ emitted at the point i and the signal $r_j(t)$ picked up at the point j.

2. The method as claimed in claim 1, in which the
5 respective eigenfrequencies $f_{0,i}$ at the various points i
are separated pairwise by an offset $\delta f/N$.

3. The method as claimed in claim 1 or claim 2, in
which, in the course of step (c), said correlation
10 signal is windowed by means of a gate function $\pi(t)$ of
width $1/\delta f$.

4. The method as claimed in claim 3, in which, in the
course of step (c), the impulse responses $h_{ij}(t)$ are
15 determined through the formula:

$$h_{ij}(t) = \Pi(t) \cdot \int e_i(\theta - t) \cdot r_j(\theta) d\theta.$$

5. The method as claimed in any one of the preceding
claims, in which the waves transmitted in the medium
20 between the emission points and the reception points
are acoustic waves.

6. The method as claimed in any one of the preceding
claims, in which, in the course of step (a), the medium
25 where the waves are emitted is reverberant.

7. The method as claimed in any one of the preceding
claims, in which the frequency interval δf is less than
or equal to $1/\tau$, where τ is the temporal dispersion of
30 the medium.

8. The method as claimed in claim 7, in which the
frequency interval δf is substantially equal to $1/\tau$,
where τ is the temporal dispersion of the medium.

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9. The method as claimed in any one of the preceding
claims, in which the duration T is at least equal to
 $N/\delta f$.

10. The method as claimed in any one of the preceding claims, in which the duration T is at least equal to $N \cdot \tau$, where τ is the temporal dispersion of the medium.

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11. The method as claimed in any one of the preceding claims, in which the elementary signals exhibit random phases.

10 12. The method as claimed in any one of the preceding claims, in which the waves are emitted with a certain passband, the frequencies f_{0i} comprise a minimum frequency f_0 and the number n is determined so that the frequency band lying between f_0 and $f_0 + [(n+1) \cdot \delta f]$
15 substantially overlaps said passband.

13. The method as claimed in any one of the preceding claims, in which the reception points are coincident with the emission points (T_1-T_N).